

# Economic viability of tree spice based cropping system under forest eco-system of Kanyakumari district

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## SUMMARY

Field experiment was conducted at Horticultural Research Station, Pechiparai during 1994-2008 to find out the suitability of spices as intercrops in different cropping systems viz., mixed and multi-storeyed cropping under forest agro-ecosystem. The results of the study indicated that inclusion of pepper alone with forest trees (mixed cropping) or a combination with cinnamon and pine apple (multi-storeyed cropping) was highly remunerative and it resulted in a net profit of Rs. 1,01,500/ and Rs. 1,18,200/-, respectively. This cropping system could result in a higher benefit cost ratio.

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## Key words :

Mixed cropping,  
Multi-storeyed  
cropping, Forest  
agro-ecosystem,  
Spice crops.

Kanyakumari District, the high rainfall zone of Tamil Nadu is located in the Southern tip of peninsular India. The hill region of this district lies 35km away from the coast and spreads from the East to the West. The major area in this zone is occupied by tropical rain forest trees and the cropping system adopted is multi species cropping system. The Horticultural Research Station, Pechiparai is situated in the hill slopes under forest agro-ecosystem. The altitude of the region is 200m above MSL. The dominant tropical forest trees occupying this region are *Terminalia paniculata* (Maruthu), *Terminalia crenulata* (Thenbavoo), *Pterocarpus marsupium* (Vengai), *Premna tomentosa* (Naithekku), *Terminallia bellarica* (Thani), *Cmelina arborea* (Kumil), *Atrocarpus hirsutus* (Ayini) etc. For the effective utilisation of resources like horizontal and vertical space, sunlight, water and nutrients in the forest agro-ecosystem, integrated cropping systems offer great scope, which would also help in the addition of lot of biomass thus indirectly improving the nutrient status of the ecosystem.

In India around 52 spices including tree spices, seed spices and herbal spices are cultivated. Most of these spices can be grown alone or in combination with other crops as a system. The choice of crop depends on the

physiography, topography, soil, climate and the market demand. Major spices viz., black pepper, nutmeg, clove, cinnamon, ginger, vanilla and seed spices are ideal component for inter/mixed cropping. Thus, the present study was formulated to assess the potentiality of spices as intercrop in various cropping systems of forest based agro-ecosystem.

## MATERIALS AND METHODS

Field experiments were initiated at Horticultural Research Station, Pechiparai during 1994 to find out the productivity and profitability of different spice crops viz., pepper, clove, nutmeg, cinnamon, chillies and ginger in mixed (Experiment I) and multistoreyed cropping (Experiment II) systems under forest agro-ecosystem. The forest trees in the experimental plot were lopped once in six months during the rainy season for regulation of shade and to provide sufficient sunlight.

Elite clones of pepper (Panniyur 1) clove (IISR-Sel.7), nutmeg (IISR-MF-2), cinnamon (IISR-CV7), pineapple (Maritious), ginger (Varadha) and chilli (local selection) were used for planting.

### Experiment I (mixed cropping):

Pepper, clove, nutmeg and cinnamon

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Crop/forest tree	Planting material	Spacing (m)	Plant population/ha (Nos.)	Fertilizer g/plant /year
<i>Terminalia</i>	--	--	120	--
Pepper	One year old rooted cutting	3 x 3	1000	100:40:140
Clove	2 year old seedling	5 x 5	400	300:250:750
Nutmeg	2 year old graft	5 x 5	400	500:250:1000
Cinnamon	2 year old graft	4 x 4	625	100:40:140

were accommodated in an experimental area of one ha (0.25 ha/crop) along with the forest trees like *Terminalia* sp. and *Atrocarpus hirsutus*. Pepper was planted in the tree basins using the tree trunk itself as the standard (3 vines/tree) and also in the interspace using *Erythrina indica*/*Glyricidia* as standard. The population maintained per hectare and the cultural practices adopted were as follows:

Observations on the total yield and yield components were recorded from the 10<sup>th</sup> year of planting *i.e.*, from 2004 to 2008 for five years and cumulative (pooled mean) yield was taken for economic analysis. Net returns were computed based on the wholesale market price of the spice

ginger

Model V-*Terminalia* sp. + blackpepper + cinnamon + pineapple

Model VI-*Terminalia* sp.+ black pepper + cinnamon + ginger

Vertically there were three crop levels wherein *Terminalia* sp. served as the top tier, black pepper and tree spices in the second tier and the low-growing spices such as ginger and pineapple served the third tier. The crop models involving ginger as one component was rotated with chillies in alternate years instead of ginger.

The plant population maintained per hectare and the cultural practices adopted were as follows:

Crop/Forest tree	Planting material	Spacing	Plant population/ha (No.)	Fertilizer NPK g/plant /year
<i>Terminalia</i> sp.	-	-	127	-
Pepper	One year old rooted cutting	As per the placement of <i>Terminalia</i> trees- @3vines /tree	381	100:40:40
Clove	Two year old seedling	9.5 x 9.5m	110	300:250:750
Nutmeg	One year old graft	9.5 x 9.5 m	110	500:250:1000
Cinnamon	One year old seedling	5 x 5 m	400	100:40:140
Ginger	Rhizome	60 x 30 cm	16,500	50:50:25 (kg/ha)
Pineapple	Sucker	60 x 30 cm	10,500	20:10:20
Chillies	Seed	60 x 30 cm	16,500	60:30:60 (kg/ha)

products for the period under observation (2004-08). Costs of cultivation included the initial establishment and other maintenance and inter-cultivation cost for the study period.

### Experiment II (multistoreyed cropping):

This trial consisted of 6 cropping models as detailed below:

Model I-*Terminalia* sp. + black pepper + clove+ pineapple

Model II-*Terminalia* sp.+ black pepper + clove + ginger

Model III-*Terminalia* sp.+ black pepper + nutmeg + pineapple

Model IV-*Terminalia* sp.+ black pepper+ nutmeg +

The height of pepper vines trained in forest trees were restricted to six meter by pruning for the convenience of harvesting. The yield of annuals/biennials were recorded from the first year / second year of planting and for the perennials from 10<sup>th</sup> year onwards as in experiment I.

## RESULTS AND DISCUSSION

The results obtained from the present investigation are summarized below:

### Experiment I:

In the mixed cropping studies, forest trees and

**Table 1: Economics of tree spice based mixed cropping system under forest agro-ecosystem**

Intercrop	Mean yield (kg/ha)	Cost of cultivation (Rs./ha)	Gross income (Rs./ha)	Net profit (Rs./ha)
Pepper	2600	55,000	1,56,500	1,01,500
Clove	1112	49,000	1,13,424	69,424
Nutmeg (Husk + mace + seed)	704+ 18+ 808	46,000	1,05,480	59,480
Cinnamon (Quills + dust + leaves)	130+ 210+ 3125	67,600	1,28,560	60,960

pepper combination was found to be the best treatment (Table 1) which recorded the highest net returns (Rs. 1,01,500 /ha). Though the highest yield of 6 kg of dried pepper per vine was recorded the mean yield was 2.6 kg/vine. The treatment recorded a total mean yield of 2600kg/ha.

Forest trees and clove combination registered a mean yield of 2.78 kg/plant and a total yield of 1112kg/ha. The net returns obtained from this combination was Rs. 69,424 /ha.

On an average, 375 fruits weighing around 9.64kg were harvested from nutmeg trees grown along with forest trees. The total husk, mace and nut yield were 704.00, 18.00 and 808.00 kg/ha. This combination (forest tree and nutmeg) registered the net profit of Rs. 59,480 /ha.

Cinnamon produced an average yield of 130 kg of quills, 210 kg of chips and dust and 3125 kg of green leaves/ha. The net profit obtained was Rs. 60,960 /ha.

### Experiment II:

Economic assessment of the intercrops in the different models of the multistoreyed cropping (Table 2) revealed that out the six models, Model-V (*Terminalia* + black pepper + cinnamon + pineapple) was found to be more remunerative and gave the highest net return of Rs. 1,18,200 /ha followed by model I (*Terminalia* sp. + black pepper + clove + pineapple - Rs. 1,00,343/ ha) and

**Table 2: Economics of tree spice based multi-storeyed cropping system under forest agro-ecosystem**

Cropping model	Cost of cultivation (Rs./ha)	Gross income (Rs./ha)	Net profit (Rs./ha)
Model I	68,500	1,78,843	1,00,343
Model II	58,000	1,42,244	84,244.00
Model III	56,500	1,31,524	75,024.00
Model IV	51,425	1,05,000	53,575.00
Model V	78,000	1,96,200	1,18,200
Model VI	73,560	1,45,381	71,821.00

the minimum net profit of Rs. 53,575.00 /ha was obtained from the model IV (*Terminalia* sp. + black pepper + nutmeg + ginger).

Among the two cropping systems studied, multi-storeyed cropping system gave more economic returns than the mixed cropping system under forest ecosystem. This might be due to the accommodation of multiple plant species per unit area, their production potential and price value. Better performance of black pepper and annual / biennial crops like ginger, pineapple and chillies under coconut based multistoreyed cropping system has already been reported by several workers (Potty *et al.*, 1979; Venkitasammy 2002; Kandianan *et al.*, 2004). From the present study, it is evident that the tree spices were the suitable components for the tropical forest agro-eco system. The practice of growing tree spices and pineapple as a component in the multistoreyed cropping / mixed cropping system in coconut / forest agro ecosystem has been well documented (Hegde *et al.*, 1990; Reddy *et al.*, 1998; Maheswarappa *et al.*, 2003; Remany, 2004).

From the present study it is concluded that the tree spices can be grown conveniently as compatible component crops under tropical forest agro-ecosystem for higher production and profit.

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